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AUTHOR(S):

ITANI, Juichi

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EFFECTS OF SOCIO-ECONOMIC CHANGES ON CULTIVATION SYSTEMS UNDER CUSTOMARY LAND TENURE IN MBOZI DISTRICT, SOUTHERN TANZANIA

Juichi ITANI

Graduate School of Asian and African Area Studies, Kyoto University

ABSTRACT Indigenous cultivation systems in the Nyasa–Tanganyika Corridor of Mbozi District, southern Tanzania, reflect strategies developed to cope with political, socio-economic, and ecological circumstances and changes. Such cultivation systems were formed under the customary land tenure system by which most lands in village are held by a few native clans. A clan elder, called the *esongo*, manages the distribution and use of each clan's land. Clans without large landholdings can earn income by borrowing land or helping an owner of an ox cultivate large fields. Therefore, their activities have also been controlled by the rule of the native clans. Clan land management by the *esongo* has created certain norms of ecological use, which have helped maintain woodlands despite economic development and population pressures. Thus, the clan-controlled land has functioned as a “commons.” Although cultivation systems have changed at times in response to internal and external socio-economic conditions, customary environmental use practices have served to harmonize human–environmental interactions. However, maize cultivation by ox plowing in permanent fields is rapidly spreading throughout this area in response to market factors and socio-economic changes. This current change may affect both local society and the environment.

Key Words: Economic liberalization; *Miombo* woodland; Nyamwanga; Ox plowing; Slash-and-burn.

INTRODUCTION

Tanzania embarked on economic liberalization under the Structural Adjustment Program (SAP) sponsored by the World Bank and International Monetary Fund in 1986. Although the National Milling Corporation (NMC) had monopolized all grain purchasing rights in Tanzania until the mid-1980s, reforms allowed private traders to compete with the NMC. Tanzania also embarked on various reforms of public services and taxation in the early 1990s. With these changes, small farmers in rural areas have increasingly needed to generate cash income and become involved in the market economy. As a result, farmers that had previously grown crops for subsistence have begun to seek cash crops suited to their ecological environments and have extended their farmland so that they can grow crops for sale.

Residents of the *miombo* woodlands of southern Tanzania have long cultivated finger millet (*Eleusine coracana*) as a main food produced by indigenous cultivation systems. Throughout Tanzania, finger millet is used in traditional food (*uji*) and beverage (*togwa*) and is a starter for local beer. The main pro-

duction areas for finger millet are the *miombo* woodlands in the southern highlands. Productivity in these areas can be remarkably high, with nutrients added in the past through slash-and-burn practices, although the specific physiological and agro-ecological characteristics of finger millet are not yet well known. In peripheral *miombo* woodlands without other available cash crops, the sale of finger millet has been a limited but important income generator. In the late 1970s, however, the government prohibited slash-and-burn cultivation in the primary woodlands, forcing farmers to change or improve their cultivation systems.

The effect of SAP-related socio-economic changes on agriculture in rural areas has varied among regions, but many new cultivation systems based on the local environment, situation, institutions, and norms have been created. Here, I examine changes in cultivation systems, with a special focus on the dissemination of ox plowing under customary land tenure arrangements in a peripheral region of Tanzania.

OVERVIEW OF THE RESEARCH SITE

I. Three Agro-ecological Zones in Mbozi District and the Research Site

Mbozi District, Mbeya Region, is located in southwestern Tanzania (Fig. 1). The district is composed of six divisions: Vwawa, Iyula, Igamba, Kamsamba, Msangano, and Ndalambo, ranging between 800 and 2,750 m above sea level (Malocho, 1997). The geographical and geological variations form three agro-ecological zones: the Unyiha Highland, the Msangano Trough, and the Ufipa Plateau (Fig. 2).

The Unyiha Highland, including the Vwawa, Iyula, and Igamba Divisions, ranges from 1,400 to 2,750 m above sea level. Rainfall is plentiful and reli-

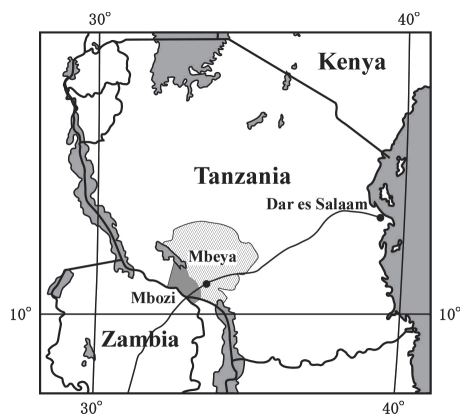


Fig. 1. Location of Mbozi District, Mbeya Region in Tanzania

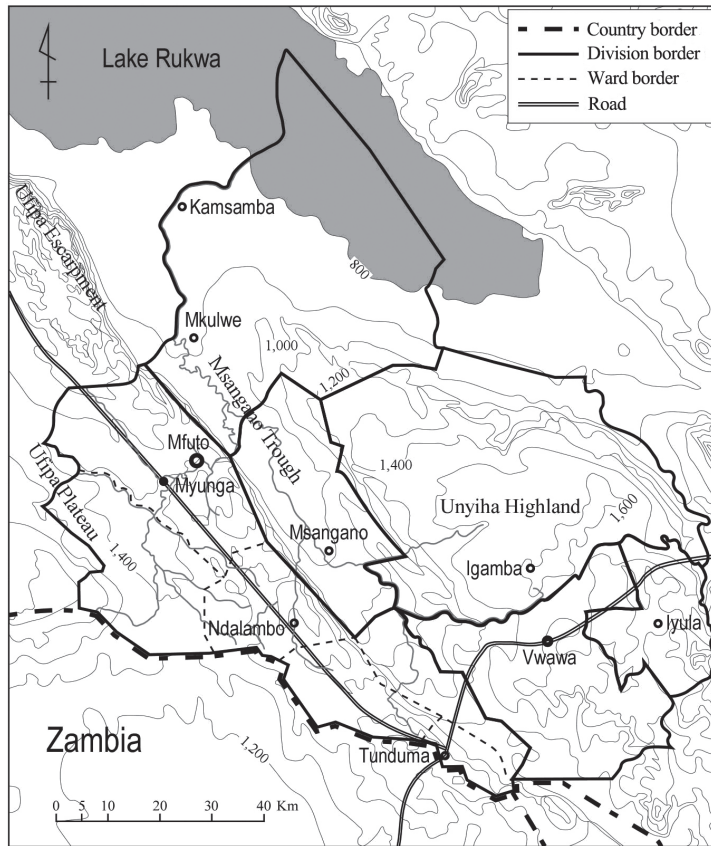


Fig. 2. Map of Mbozi District

able (Knight, 1974), with precipitation in Igamba Division during the 2004/05 rainy season reaching 1,349 mm. This zone is a major production area for Arabica coffee, which was introduced by missionaries in the 1930s; in recent years, the Unyiha Highland area has led Tanzania's coffee production. The Nyiha people mainly cultivate maize and beans on the uplands and finger millet and other vegetables in seasonal swamplands for food. Vwawa town, an administrative center, is located along the paved road and Tanzam railway connecting Dar es Salaam with Zambia. Nearby transportation and easy access means that food crops are also sold at markets. The original vegetation is *miombo* woodlands including *Parinari curatellifolia*.

The Msangano Trough, surrounded by the Ufipa Escarpment and Unyiha Highland, sweeps from Msangano to Lake Rukwa. This area ranges from 800 to 1,100 m above sea level and is hot, dry, and prone to drought; the Kamsamba Division received 748 mm of precipitation during the 2004/05 rainy season. Until the 1980s, mainly *Acacia-Combretaceae* woodlands (*Acacia tortilis*, *A. tanganyikensis*, *A. nilotica*, *Combretum obovatum*, *C. adenogonium*, *Terminalia*

sericea) covered the area, but many have been destroyed as farms have expanded. Paddy rice cultivation using ox plowing has spread in this area since the early 1990s as a means of income generation, and the flat plain of the Msangano Trough has become one of the main production areas for high-quality rice in the district. There are two divisions in this zone: Msangano and Kamsamba. The Nyamwanga people mainly live in the former, whereas several peoples, including the Wanda and the Sukuma, occupy the latter. Their main food crops are maize and sorghum. The area is also known for cattle, raised by the Sukuma, as well as fish from Lake Rukwa.

The Ufipa Escarpment runs along the Rukwa Rift Valley toward the southern edge of the escarpment, forming the undulating Ufipa Plateau 1,200 to 1,600 m above sea level and extending into Zambia. In Ndalambo Division, located in the southeastern part of the plateau, an unpaved road connecting Sumbawanga (the administrative center of Rukwa Region) and Tunduma (a border town between Tanzania and Zambia) runs parallel to the escarpment. No remarkable commercial crops have been developed because this zone has unreliable rainfall and infertile soil and is far from markets. The Nyamwanga residing on the plateau have cultivated finger millet as a main food crop in the past and more recently as cash crop, using several indigenous cultivation systems. They have arranged their cultivation systems or introduced new ones to cope with political, economic, and ecological changes brought by globalization. I examined agricultural changes in the Ndalambo Division by conducting field research from 2001 to 2006 at Mfuto Village, Myunga Ward, Ndalambo Division.

II. Ecological Environment

The Nyamwanga territory extends from the low-lying Momba River in the northwest to the woodland-covered plateau in the southeast, which spans the Tanzania–Zambia border between approximately 8°30′–9°50′ S and 32°15′–32°50′ E; the northern half is located in the southwestern Mbozi District. The original vegetation is *miombo* woodland, but primary woodlands remain only at the escarpment, the rest have been destroyed by human activities. The current landscape on the plateau is spotted seasonal swamps covered with grasses, as well as mixed, secondary *miombo* woodlands (*Brachystegia speciformis*, *B. boehmii*, *B. manga*, *Julbernardia globiflora*, *J. paniculata*, *Isoberlinia angolensis*) and grasslands. Indigenous cultivation systems depend on the natural resources and vary based on vegetation, soil, and water conditions. According to data obtained from the metrological station in Myunga Village, located 7 km from Mfuto Village, in the 2004/05 rainy season (November–April) 640 mm of rain fell and the mean temperature was 23°C (Fig. 3).

III. Livelihood

Today, the staple foods of the Nyamwanga are maize and cassava. Hybrid maize was likely introduced to this area after “villagization” measures (national

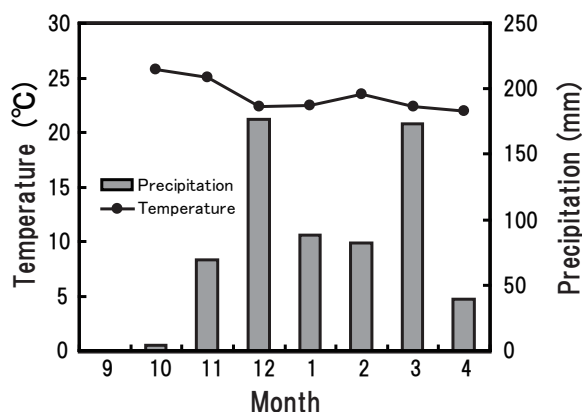


Fig. 3. Precipitation and temperature in Myunga Village, Ndalambo Division in 2004/05

policies to settle rural residents in permanent villages), although cassava was cultivated earlier. These crops are grown on ridges made in permanent fields. Before the introduction of these crops, finger millet was a staple food; it has recently become the most important cash crop in this area. However, finger millet does not grow well in the permanent fields used for maize or cassava cultivation; an indigenous cultivation system is always used for its production. Thus, indigenous cultivation systems have successfully remained in use in the area to generate cash income.

Other food crops include sorghum, sweet potato, pumpkin, cowpea, common bean, pigeon pea, groundnut, sunflower, rape, okra, and tomato. Cash crops are more limited: finger millet, sunflower, common bean, and more recently, maize and minor amount of tobacco. Common bean is grown on ridges within seasonal swamps during the dry, cool season for both subsistence and sale.

Cattle, donkey, pig, goat, sheep, chicken, and duck are also raised, but not by all households; ownership of cattle and donkey is particularly limited. In Mfuto Village, only one-quarter of all households had cattle in 2006. Milk and meat products from cows are sold in the village, and manure is applied only rarely to maize fields. An ox owner can also cultivate fields by ox-drawn plowing.

Villagers living at the riverside catch fish using creel baskets or poison methods based on the leaves of *Tephrosia* species. Various wild plants, fruits, and mushrooms are gathered. In the past, most wild animals such as antelopes, wild pig, duiker, squirrel, rat, and birds were hunted by archery or wire traps in the *miombo* woodlands.

IV. The People

Wilson (1958) called the general region of Mbozi the “Nyasa–Tanganyika Corridor.” This name reflects the particular configuration of landforms, including lakes, that funnel people and ideas between eastern and southern Africa (Knight, 1974). The Nyamwanga are composed of various ethnic groups that migrated

from southern Tanzania, southern Congo, Zambia, and Malawi (Willis, 1966). The chiefly line of the Nyamwanga is said to have been founded by a man called Musyani who came from Bisa land. Musyani was a brother of a chief; because he wished to become a chief himself, he left his homeland accompanied by his friends and retainers. First, he went to Isoka near the border of Malawi. The name Nyamwanga seems to have originated from the name of the Lwanga River in Isoka. Afterward, Musyani settled in Mwenzo near the border of Zambia and Tanzania. Because he taught the inhabitants how to smelt iron, as well as all of the agricultural technologies practiced in his own country, the people elected him as chief of their land. Musyani and his successors approved the migration of various peoples into Nyamwanga territory. As a result, various cultivation systems were brought into the area. Today, variations in ethnic origin are shown in clan names.

The Nyamwanga practice patrilineal inheritance of land and entitlement. All clan names begin with "Si-" (e.g., *Sikanyika* or *Simkonda*); usually for females, Si- is replaced with "Na-" (e.g., *Nakanyika* or *Namkonda*). Polygamy is common, although most Nyamwanga are Christians. Marriage within one's patrilineal or matrilineal clan is strictly prohibited.

Only men can inherit lands in Nyamwanga society. If a father dies, his sons share all the lands equally, and his wives and daughters cannot inherit any land, although they can inherit property such as livestock. Usually, a widow marries her husband's brother, ostensibly or actually, and cultivates the lands of her new husband. If not married, the youngest son inherits the land that his mother cultivated before his father died and allows her to cultivate there.

In 2005, the Mfuto Sub-village was divided into two additional sub-villages; the three sub-villages are Mfuto, Chipoma, and Uganda in Mfuto Village. The village had 162 households in August 2001 and 191 households in December 2006 (Table 1). The increase in the number of households mainly reflects marriage by the younger generation in the village. According to the household survey in 2006, 20 Nyamwanga clans are represented in the village; the exceptions are primary school teachers belonging to three other ethnic groups. Of the 191 households, 56% belong to four clans (Fig. 4). These four clans are native to this area and own large tracts of lands. Such native clans exist in each village, and the succession of their land ownership has been approved, even since villagization.

Table 1. Change of household in Mfuto Village from 2001 to 2006

Sub-village	Household				2006
	2001	married	immigrant	emigrant	
Chipoma	55	13	5	6	67
Mfuto	107	23	4	10	69
Uganda	-	-	-	-	55
Total	162	36	9	16	191

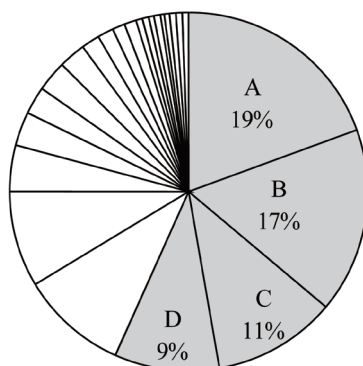


Fig. 4. Percentage of household in each clan

DIVERSIFICATION OF INDIGENOUS CULTIVATION SYSTEMS

Bantu migrants introduced their original cultivation systems in the corridor region and have further developed them in the various environments. All the indigenous cultivation systems of the area rely on soil fertility recovery under fallow (Itani, 2002). The decomposition of organic matter can be accelerated by hoeing the grassland in the early dry season, by slash-and-burn in woodlands, or by a mixture of these methods. I next explain the characteristics of each system.

I. *Miwanda*

The *miwanda* system was probably derived from the *nkomanjila* system practiced by the Nyiha people. This cultivation is always practiced in the primary *miombo* woodlands on the escarpment. Trees are cut in the mid-dry season; branches are removed, gathered around the stumps, and set on fire. The farmer then lightly hoes the surface of the field after the rains and broadcasts finger millet grains. These seeds are covered with soil using a branch. At the next dry season, the finger millet is harvested; crop residues are burned in the late dry season. Finger millet is grown again in the following rainy season, but the field is then abandoned after the second harvest.

In the primary woodland of the Ufipa Escarpment, although the canopy of rocky woodlands is made up of *Brachystegia spiciformis* and *B. microphylla* (Table 2), these trees are sensitive to heat and can die from burning procedures. Other trees can survive and grow new leaves and branches from the burned stumps. Therefore, agricultural burning alters the tree species composition of the woodlands. Because the government has prohibited slash-and-burn cultivation in primary woodlands, *miwanda* is now practiced only in rare cases.

Table 2. Major trees in the Ufipa Escarpment and the fire tolerance

Family	Species	Local name	Fire tolerance
Araliaceae	<i>Cussonia arborea</i> A. Rich	<i>Enampembefuzu</i>	high
Bignoniaceae	<i>Markhamia obtusifolia</i> (Bak) Sprague	<i>Elamba</i>	high
Caesalpinaceae	<i>Brachystegia spiciformis</i> Benth.	<i>Umsanyu wa mmwamba</i>	low
Caesalpinaceae	<i>Brachystegia microphylla</i> Harms	<i>Umukongolo</i>	low
Caesalpinaceae	<i>Julbernardia globiflora</i> (Benth.) Troupin	<i>Ekalumbwe</i>	high
Combretaceae	<i>Combretum adenogonium</i> A. Rich	<i>Umwambila</i>	high
Malvaceae	<i>Azanza garckeana</i> (F. Hoffn) Exel & Hillcoat	<i>Umtoo</i>	high
Sapindaceae	<i>Zanha africana</i> (Radlk.) Exell	<i>Echiwangalume</i>	high

II. *Ntemele*

The *ntemele* system of field creation is basically the same as that of the *citemene* system practiced by the Bemba people in Zambia (Kakeya & Sugiyama, 1987). In the mid-dry season, men climb tall trees and lop off only their branches. The dried branches are carried to the center of a clearing and piled up by women. These piles are burned before the rains come. The soils of the burned field are heated by the fire, and a large amount of ash accumulates on the surface. After the rains, farmers broadcast finger millet seeds only in the burned places, called *ipya* in the Nyamwanga language. The soil conditions are suitable for finger millet, and the productivity is remarkably higher than that obtained using other types of cultivation. After harvest, the field is called *izuka*. Finger millet residues in *izuka* are burned at the end of dry season, and other crops such as maize, cassava, and common bean are grown. Normally, after cropping for 2 years, the field is left fallow for many years until the woodland completely recovers. The fallow field is called *impepe*. Recently, *ntemele* fields have almost disappeared because of the shortage of sufficient woodlands; however, the Nyamwanga still say that *ntemele* is their proper cultivation system.

III. *Etumba* (Mound Making)

The Fipa people residing in northwest Nyamwanga land practice a unique mound cultivation in the grassland called *intuumba* in their language (Willis, 1966). In the early dry season, they mow the tall grasses in the grassland using a billhook and remove the grasses from the field. They peel up the surface soils, including roots and short shoots, using a hoe; the surface soil is turned over and piled up. The cleared field is dotted with these soil knobs (mounds), about 40–80 cm in height and 80–100 cm in diameter. Because the construction of these mounds is very difficult, large areas cannot be cultivated. The mounds are left in the field without planting throughout the dry season. The roots and shoots of grasses buried in the mound mostly decompose. Just before the rains,

they flatten the mounds and broadcast finger millet seeds. Afterward, the field is rotated with other crops such as maize, groundnut, sesame, and beans. After cropping for 3 to 5 years, the field is often left fallow for 3 to 4 years.

The Nyamwanga also have a similar cultivation method called *etumba*, which they practice in secondary woodlands, in contrast to the grasslands used by the Fipa. Although the process of making mounds is the same as that of the Fipa, in the mid-dry season, the Nyamwanga cut down all the trees in the field and pile them up at several spots. The mounds are flattened after burning the woody heaps at the end of the dry season. The burned spot is called *ipya*, and the growth of finger millet at *ipya* is much better than in other places. *Etumba* combines slash-and-burn with composting, methods oriented toward the dwarf secondary woodlands. Similar mound cultivation in woodlands is also done by the Mambwe people, southwestern neighbors of the Nyamwanga (Stromgard, 1989).

IV. *Etumba* (Ox Plowing)

Some households cultivate the woodland floor by ox plowing instead of mound making. This method is also called *etumba*. Ox plowing is carried out once in the early dry season (*kubundula*) and once in the rainy season (*kubundichila*); the first plowing is done to bury the grasses in the soils, whereas the second breaks the clods and flattens the field. After broadcasting the grains, the field is stamped by oxen to embed the seeds into the soils. Other work activities are the same as those done when making *etumba* mounds. It is possible to cultivate large fields by ox plowing. However, the tree density is thinner than that in mound *etumba*. For ox plowing, farmers use a unit called *homu*; this unit is the field size a pair of oxen can cultivate in 1 day. The area of *homu* is flexible depending on the ground conditions; for example, it indicates one-third of an acre in woodland where numerous tree roots make cultivation more difficult, and one-half of an acre in easily tilled permanent sandy fields.

V. *Sindeulale*

Drying hardens the soil; thus, the first plowing (*kubundula*) in ox-plowed *etumba* is limited to the beginning of the dry season. Very few of households own many oxen. If plowing is delayed for any reason, farmers may have to abandon the first cultivation (*kubundula*) in the early dry season and condense their plowing schedule to immediately after the rain, with a second plowing (*kubundichila*) 1 month later. Because this system, which is called *sindeulale*, cannot produce sufficient fertility for finger millet, farmers usually grow cassava in the field instead.

VI. *Nkule*

The Nyiha practice a grass-fallow cultivation system called *nkule* in the grasslands. The techniques of *nkule* cultivation can be applied in both uplands covered with tall *Hyparrhenia* grasses (in fields called *nkule*) and the upper margins of seasonal swamps covered with short grasses and/or turf (in fields called *ihombe*; Knight, 1974). Although the Nyamwanga also have a type of cultivation called *nkule*, that type of cultivation is referred to as *ihombe* by the Nyiha. The field is prepared in swamp margins covered with sufficient grasses or turf during the dry season. Root mats of several centimetres in depth on the soil surface, formed by turf, are peeled off, overturned, and dried for 1 or 2 months; this turf is then piled by hand in mounds 1.0–1.5 m in diameter and 0.5–1.0 m in height. In the late dry season, the mounds are set on fire from the inside and encircled with a covering of topsoil to enclose the fire. The fire smolders inside the mounds for 1 or 2 days until all the biomass turns to white ash. After the rains, finger millet seeds are broadcast across the ash-covered field. Small ditches for drainage enclose the field. The finger millet planted at the burned spots grows very well.

VII. *Ichizule*

After villagization, people began to grow maize, some leguminous crops, and vegetables in permanent home gardens (*ichizule*) established around their new settlements. These fields contain ridges formed by hoeing and are continuously cultivated without fallow or fertilizer applications; ox plowing is carried out every several years to recover fertility. In recent years, *ichizule* fields have expanded.

CHANGES IN CULTIVATION SYSTEMS

I. Before Economic Liberalization

The Nyamwanga elders say that their original cultivation system was *ntemele* and that their people produced finger millet using the slash-and-burn cultivation systems of *ntemele* and *miwanda* when the area was fully covered by primary *miombo* woodlands. As the primary woodlands became degraded, they were forced to modify or recreate their systems, creating the *etumba* system, which combined *ntemele* with a mound-type cultivation practiced by the Fipa and Mambwe peoples in the grasslands. They shifted the locations of their households and fields in search of fertile lands every several years.

In 1974, however, the villagization program mandated fixed settlement; the villagers then shared their permanent home gardens for subsistence. In Mfuto Village, only three areas, i.e., Chipoma, Mfuto, and Nakatendo, owned by three

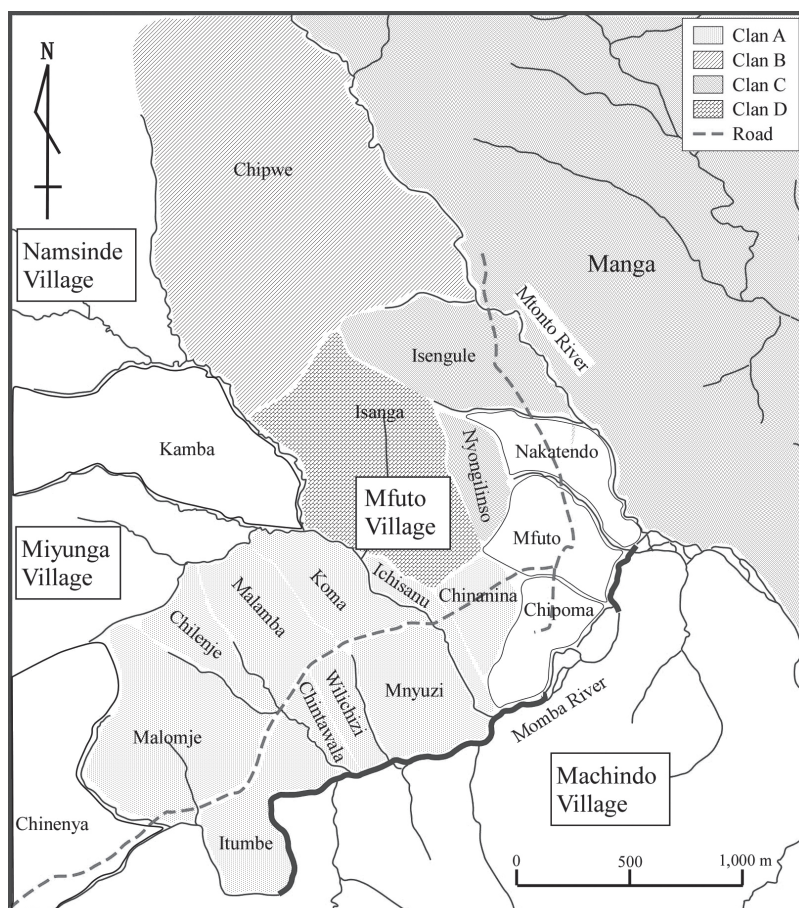


Fig. 5. Map of Mfuto Village

clans (clans A, B, and C) were shared by all the villagers; the ownership of other lands was identified and vested in the native clans (Fig. 5). As a result, the households of four major clans (clans A, B, C, and D) continued to own most of the lands in the village, whereas others shared the narrow village lands. The shift toward more intensive land use was enhanced by the National Maize Project that began in 1974–75 and included the introduction of subsidized hybrid maize seeds, fertilizers, and pesticides (Birch-Thomsen, 1999). This project was not available in Mfuto Village, which was not easily accessible from the main road connecting Tunduma with Sumbawanga. However, the permanent cultivation of maize in home gardens continued after the official project ended, and the main staple food changed gradually from finger millet to maize.

Since the late 1970s, the Tanzanian government has prohibited slash-and-burn cultivation in the primary woodlands; hence, the *miwanda* system practiced on the escarpment has disappeared, and the *ntemele* system has been practiced only in secondary woodlands. As a result of less woody biomass being burned, fin-

ger millet yields decreased remarkably, and *ntemele* cultivation was phased out in favor of the mound *etumba* system that mainly uses grass biomass.

II. After Economic Liberalization

Finger millet was the only commercial crop for marginally located Mfuto Village. After the grain market in Tanzania was liberalized in the mid-1980s, some ox owners began to use oxen to pull plows and expand their finger millet fields. The woodland floor was cultivated in the early dry season by ox plowing instead of mound making. The introduction of ox plowing allowed for the enlargement of *etumba* fields and a subsequent increase in finger millet production. Although the soil fertility of the system also depends on the natural biomass produced during the fallow period, the tree density was thinned to ease plowing; thus, grass biomass became a more important source of soil fertility.

Low-density and low-quality road networks isolate rural areas from markets (Platteau, 2000). The finger millet growers in Mfuto Village had to take their products to the main road by donkeys because poor road conditions made truck transportation unfeasible. In 1994, the villagers constructed some wooden bridges and repaired access from the main road. Their efforts allowed private traders to drive to the village in trucks; with this new market access, the villagers began to produce a large amount of finger millet and other traditional food crops for sale. Ox plowing spread in the village, and all ox owners began to practice ox plowing. However, the number of ox owners did not increase because oxen were very expensive.

The rainy season of 1997–98 included extreme El Niño-driven storms that ruined agricultural crops throughout Tanzania. In Mfuto Village, many fields produced few, if any, crops. The villagers planted cassava even in fallow fields during the following dry season and then enlarged their permanent fields.

Nearby Zambia has suffered from anomalous weather conditions since 2002, which have resulted in repeated episodes of both flooding and drought and severe food shortages (National Climatic Data Center, 2001; FAO, 2005). The famines led to skyrocketing prices for food cereals, especially maize, in southern Tanzania. For example, in August 2001, a 90-kg bag of maize cost TSh. 7,000, but in August 2003, the same amount of maize cost TSh. 35,000. Given these high prices, villagers sold the maize that they had stored for subsistence to the many traders who came to the village. Cassava grown in permanent fields has begun to replace maize as a cash crop. However, the prices of the main food crops fluctuate depending on the weather and conditions in other areas, as illustrated by the drop in price for maize in 2006 after the recovery of food production in Zambia.

LAND TENURE SYSTEM AND ECOLOGICAL ENVIRONMENT

Nyamwanga villages are generally composed of many clans, but the native

clans that have resided in the area since before villagization own the largest amounts of land. In Mfuto Village, although 20 clans are represented, more than one-half of the households belong to four clans of the Nyamwanga (Fig. 4). Usually, the Nyamwanga lands are divided into areas bordered by geographical features such as mountain ridges or valleys independently of the administrative division, and each area is named (Fig. 5). The Momba River, which forms a southern border with the neighboring village Machindo, is divided into 16 parts within 2 km between a junction of the small river Matonto and the border with Myunga, another neighboring village. Each part is named after a river feature. For area residents, the Momba River is a basis of life, providing fish, a place for washing and bathing, and drinking water. The sub-village names Mfuto and Chipoma also relate to the river.

Village governance at the time of villagization mandated the sharing of these lands; for example, Mfuto Village, Chipoma, Mfuto, and Nakatendo (Uganda Sub-village) areas were treated as village land (Fig. 5). The villagers cultivate maize as the main food in home gardens, *ichizule*, established around their homesteads. It appears that the intervention of villagization solidified what had been vague notions of land tenure, identifying most lands as clan lands. A clan's land is managed by an elder leader called "*esongo wa waluku*." For example, the *esongo* of clan A holds the Chinanino, Koma, Mnyuzi, Wilichizi, and Isanga areas of Mfuto Village, the Chilenje, Chintawala, and Malamba areas of Myunga Village, and some woodlands in Machind Village. The *esongo* of clan B holds the Chipwe area; the *esongo* of clan C has the Nyongilino, Nakatendo, Isengule, and most of the Manga areas, and the *esongo* of clan D has the Isanga area (Fig. 5). *Esongo* play an important role by sharing lands with clan members who are establishing a new household or desire more arable land. A householder given individual land is considered to own the land and can either use it himself or sell it. However, if he destroys the ecological environment irrecoverably or sells immediately, the *esongo* will not allow him to obtain or borrow other plots of the clan's land. Therefore, the *esongo* can continuously manage all the clan's lands indirectly.

As finger millet became important for cash income and food, larger tracts of woodlands were required for its continuous production because cultivation methods, especially those involving slash-and-burn, involve a long fallow period. So that, finger millet cultivation is usually cultivated in not individual land but clan land. Because the population of Mfuto Village has grown, home garden production cannot support families. Households that are not part of native clans have had to purchase or borrow land from the native clans. In these cases, they need permission from the *esongo* or their representatives to use the lands, but they usually do not have to pay rental fees. Although members of clans A, B, and C of Mfuto Village have kinship relations, they also must obtain permission to use each other's land (Fig. 6). *Esongo* limit how long borrowers can use a field, requiring them to shift to other lands after 1 to 2 years of cultivation.

Thus, the clan is remarkably important in Nyamwanga society. Problems involving clans occasionally occur. For example, the people of clan E and clan

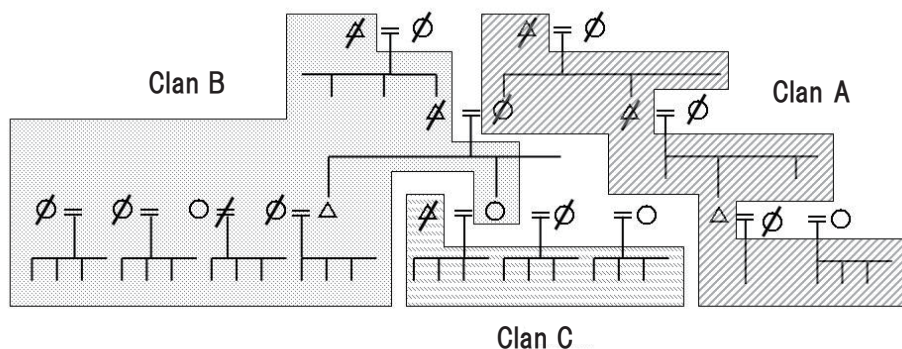


Fig. 6. Kinship among three native clans

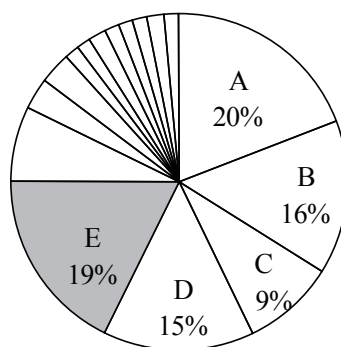


Fig. 7. Percentage of ox owner (household) in each clan

C called themselves by the same clan name, but did not recognize any kinship to each other, with clan E regarding its origins as different from those of clan C. This matter was clarified a couple of years ago when the elders of clan C demanded that clan E should show their origin. Clan C owned large tracts of lands in the Manga area; nevertheless, they did not have enough oxen to effectively use their lands. On the other hand, clan E had many oxen (Fig. 7) and wanted to have free use of the large field areas. Clan E has developed large-scale ox-cultivation of finger millet in the Manga area using the name of clan C. Clan E has contributed to the dissemination of ox plowing, but vast areas of secondary woodland may have been destroyed over the last decade because the *esongo* of clan C hesitated to interfere with clan E's activities when their kinship remained unconfirmed.

SPREAD OF OX PLOWING

The Nyamwanga have had cattle since the early 19th century for bride wealth and meat; ox plowing began to spread into the Ndalambo Division after villagization in 1974. According to a sub-chief of the Nyamwanga, in the late

1930s Alinani, a Nyamwanga chief in Msangano, first adopted ox-plow technology, which was practiced on the farm of the Mkulwe Church (Fig. 2). Ox plowing in Mfuto Village began in 1955, and the present *esongo* of clan A, who had worked at a sisal plantation near the northern coast town, Tanga, purchased an iron plow and a pair of trained oxen at Mkulwe on the way back from Tanga. However, ox plowing did not initially spread in his village because the area was covered with deep woodlands and the *ntemele* system was still mainly practiced there. The National Maize Project began in 1974; although the project lasted only 2 years, the practice of cultivation in permanent fields continued to spread. Ox plowing also expanded gradually with the expansion of permanent fields.

Economic liberalization and repair of the access road have enhanced the availability of ox plowing. Nevertheless, in 2002, only 16.7% of households in Mfuto Village had oxen and 22.2% used ox plowing (Table 3). The high cost of oxen has remained a constraint. For farmers without a reliable income source, purchasing an ox is too expensive. As in numerous other ethnic groups, bride wealth also includes cattle in Nyamwanga society (Table 4). Calves cost relatively less than oxen, but are also quite expensive: TSh. 120,000–150,000 in

Table 3. Numbers of ox owner and household practiced ox plowing

Year	Household							
	Cattle owner				Ox plowing			
	Ox	Cow only	Calf only	Total	Owner	Labor exchange	Wage labor employment	Total
2001	27	0	0	27	27	9	0	36
(%: n=162)*	(16.7)	(0.0)	(0.0)	(16.7)	(16.7)	(5.6)	(0.0)	(22.2)
2006	41	4	5	50	41	23	5	68
(%: n=191)*	(21.5)	(2.1)	(2.6)	(26.2)	(21.5)	(12.0)	(2.6)	(35.6)

* Percentage to total household

Table 4. Bride wealth and the prices in Mfuto Village in 2006

Item	Father	Mother	Total (estimated price in 2006)
Cattle	2	2	4 (TSh. 500,000-600,000)
Goat	1	1	2 (TSh. 20,000-40,000)
Chicken	6	6	12 (TSh. 50,000-60,000)
Cash	TSh. 10,000	TSh. 40,000	TSh. 50,000
Blanket	1	1	2 (TSh. 30,000-40,000)
Hoe	1	1	2 (TSh. 5,000)
Ax	1	-	1 (TSh. 5,000)
Spear	1	-	1 (TSh. 5,000)

2006. For a finger millet farmer, this price would require the sale of finger millet harvested from 1 to 2 ha. Furthermore, finger millet, which was the only local cash crop in 2002, requires plenty of labor and large plots of arable land. Therefore, only some ox owners cultivated this cash crop on a large scale; most others had no means of obtaining cash, except by helping ox plowing cultivators such as by cutting trees, sowing seeds, weeding, harvesting, and threshing. Laborers could earn enough income to purchase dairy commodities, but not enough to build assets or buy a calf. A household with no ox had little or no chance of purchasing one. However, even ox owners who also had large fields generally did not enjoy high incomes because of the high labor costs.

The food shortage in Zambia after 2002 affected the rural economy in southern Tanzania. The price of maize suddenly quintupled, and most households in Mfuto Village began to cultivate maize as a cash crop in permanent fields. They expanded their permanent fields into the fallow lands of *etumba* to grow enough food for consumption, as well as for sale. To cultivate larger fields, some households that had no oxen began to practice ox plowing through labor exchange or wage-labor employment arrangements (Table 3). In the labor exchange, the person without the ox provides labor to the ox owner in exchange for being allowed to borrow the oxen and plow. By wage labor, the ox owner cultivates other's fields for a fee. Many householders bought oxen, cows, and calves with the income they earned from maize cultivation (Tables 3 & 5). Ox plowing for maize cultivation tended to spread rapidly in the village. At the same time, other methods fell out of favor; for example, hand hoeing for finger millet production, such as the mound *etumba* system, was not practiced in 2006 (Table 6).

Table 5. Number of new cattle owner between 2001 and 2006 and means of obtaining cattle

New owner	Inheritance	Bride wealth	Purchase			
			Maize	Finger millet	Rice	Others
23	1	5	9	5	1	2

Table 6. Numbers of household growing maize and finger millet by ox plowing or hand hoeing

	Household			
	Maize		Finger millet	
	Ox plowing	Hand hoeing	Ox plowing	Hand hoeing
2001	36	126	25	10
(%: n=162)*	(22.2)	(77.8)	(15.4)	(6.2)
2006	68	123	53	0
(%: n=191)*	(35.6)	(64.3)	(27.7)	(0.0)

* Percentage to maize or finger millet growers

CONCLUSION

Various indigenous cultivation systems in the Nyamwanga territory have been formed as strategies to cope with ecological, political, and socio-economic changes. The Mambwe in northern Zambia have practiced a mound cultivation system in grasslands after the woodlands became degraded from overuse (Watson, 1958). The system of mound cultivation was developed by both the Fipa and the Mambwe of the grasslands, and represents the breakdown of the *citemene* system practiced by the Bemba of woodlands (Stromgard, 1989). The mound *etumba* practiced in the secondary woodlands by the Nyamwanga can be regarded as a transitional form between *citemene* in the woodlands and mound cultivation in the grasslands. This cultivation system may be sustainable if the secondary woodlands are maintained under regulation by the *esongo*.

Before villagization, the Nyamwanga, who had already established the mound *etumba* system in secondary woodlands, had selectively used *ntemele* and mound *etumba* in response to changing vegetation and their custom of shifting fields and settlements within the clan's lands. In 1974, the government's villagization program required them to gather in a fixed settlement. Around the same time, maize cultivation in permanent fields was introduced, and slash-and-burn cultivation in primary woodlands was prohibited. After economic liberalization, finger millet became an important cash crop and began to be grown in larger *etumba* fields cultivated by ox plowing. Recently, maize cultivation by ox plowing in permanent fields has spread due to greater access via the repaired road to the village and food shortages in neighboring Zambia.

At villagization, the village government approved the customary ownership of land by the native clans, so that the clan's lands were defined clearly. This land division speciously defined economic differences between native and migrated clans; however, in reality, people from the migrated clans could borrow arable lands regulated by the native clan. There are no conspicuous economic differences among the clans or households. The various changes to cultivation systems have taken place under customary land tenure. Whereas external factors have influenced the local society and economy, customary norms have served to moderate and regulate human impacts on the environment.

However, the environment is fragile, and economic activities can have devastating effects. As indicated by the case of clan E, the unregulated expansion of farm fields, particularly by ox plowing, can lead to the desertification of woodlands. Indigenous cultivation systems that depend on the reproduction of natural resources have been maintained under delicate balances of labor, crop characteristics, the recovery rate of biomass, and fallow periods. Although a new technology such as ox plowing can minimize labour and increase field sizes and harvests, it may disturb the balances among socio-economic and ecological factors. Therefore, social regulation may be necessary for sustainable use of the local environment.

In the case of clan E because they do not have *esongo* that regulates the use of ecological circumstances, the larger secondary woodlands have been exploited

by ox plowing and degraded rapidly. Clan lands, as managed by the *esongo*, appear to have created certain norms of environmental use and protection of the secondary woodlands. Thus, clan land has functioned as a type of “commons.” If these lands were distributed to individuals, many might be immediately changed to permanent fields for maize cultivation in response to both population growth and individualism. In the near future, village land may be defined and registered as part of the Village Land Act of 1999. As stated in the act, customary rights of occupancy must be considered sufficiently. At the same time, the roles of customary land tenure systems in environmental conservation should also be considered.

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Author's Name and Address: Juichi ITANI, *Graduate School of Asian and African Area Studies, Kyoto University, 46, Shimoadachi-cho, Yoshida, Sakyo-ku, Kyoto 606-8501, JAPAN.*
E-mail: itani@jambo.africa.kyoto-u.ac.jp